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EXAMINER	
CROW, ROBERT THOMAS	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/677,395	LETANT ET AL.	
	Examiner	Art Unit	
	Robert T. Crow	1634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 January 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) *10 and 11* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9 and 12-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Art Unit: 1634

FINAL ACTION

Status of the Claims

1. This action is in response to papers filed 24 January 2008 in which no claims were amended, no claims were canceled, and new claims 12-18 were added. All of the amendments have been thoroughly reviewed and entered.

The interview summary is acknowledged and the interview record is complete.

The previous rejections under 35 U.S.C. 112, second paragraph, are **withdrawn** in view of Applicant's arguments on pages 6-7 of the Remarks filed 24 January 2008.

The previous rejections under 35 U.S.C. 102(b) and 35 U.S.C. 103(a) are **maintained**. Applicant's arguments have been thoroughly reviewed and are addressed following the rejections necessitated by the amendments.

Claims 1-9 and 12-18 are under prosecution.

2. The rejections of new claims 12-18 presented below are new rejections necessitated by the amendments.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 7-8 and 16-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Branton et al (PCT International Publication Number WO 00/079257 A1, published 28 December 2000 as evidenced by Stryer (Biochemistry, 2nd ed., pages 13-15 and 575 (1981)).

It is noted that the prior art of Stryer is relied upon solely for the teaching that proteins comprise functional groups; thus, the claims remain rejected over the prior art of record.

Regarding claim 7, Branton et al teach an apparatus. In a single exemplary embodiment, Branton et al teach a substrate in the form of a membrane having one or more apertures formed therein (page 4, lines 22-30). Each aperture has a tapered portion with a top diameter greater than a bottom diameter and wherein in each aperture, the tapered portion transitions into a cylindrical portion having a diameter equal to said bottom diameter of said tapered portion; namely, Figure 3E shows the claimed aperture structure. Branton et al further teach crosslinkers attached to an inner wall of said at least one aperture; namely, chemical crosslinkers are bound to the aperture (page 38, lines 24-30). Branton et al also teach chemical functional groups in the form of polymerases attached to the substrate at or near one end of the cylindrical portion of the aperture (page 38, lines 24-30). Polymerases are proteins, which comprise chemical functional groups as evidenced by Stryer. Stryer explicitly states that proteins are built form amino acids that have functional groups occurring as side chains on the residues (pages 13-15) and that DNA polymerases are protein (page 575).

Regarding claim 8, Branton et al teach apparatus of claim 7, wherein the substrate is glass (page 4, lines 19-25).

Regarding claim 16, Branton et al teach apparatus of claim 7, further comprising electrodes positioned to allow measurement of a current across the aperture; namely, conducting electrodes are provided on both sides of the membrane to enable electronic sensing (page 5, lines 20-26), and current is detected (page 8, line 30-page 9, line 5).

Regarding claim 17, Branton et al teach apparatus of claim 16, further comprising a device coupled to the electrodes for measuring the current across the aperture; namely, an ammeter or electrometer (page 7, lines 10-11).

Regarding claim 18, Branton et al teach apparatus of claim 17, wherein coupling of a chemical or biological material to the antibodies of chemical functional groups causes a change in current across the

aperture, the change being detectable by the device; namely, current is detected as a result of polymer interactions with the aperture (page 8, line 30-page 9, line 5).

In addition, it is noted that the courts have held that "while features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function." *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997). In addition, "[A]pparatus claims cover what a device *is*, not what a device *does*." *Hewlett-Packard Co. v. Bausch &Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original). Therefore, the various uses recited in claim 18 (e.g., coupling a material [which is an **active step**], or causing a change in current) fail to define additional structural elements to the device of 18. Because Branton et al teach the structural elements of claim 18, the claim is anticipated by Branton et al. See MPEP § 2114.

Response to Arguments

Applicant's arguments filed 24 January 2008 (i.e., the "Remarks") have been fully considered but they are not persuasive for the reason(s) listed below.

A. Applicant argues on pages 7-8 of the Remarks that the examiner has not supported that polymerases have functional groups.

However, as detailed above, Stryer teaches DNA polymerases , as exemplified by DNA polymerase I, are proteins and that the amino acids that make up proteins have side chains comprising functional groups. It is also noted that Stryer is a basic introductory biochemistry textbook; thus, the fact that the teaching that polymerases are proteins and proteins have functional groups is found in an introductory textbook underscores that the examiner's previous assertion is, in fact, capable of such instant and unquestionable demonstration as to defy dispute.

B. It is also noted that page 8 of the Remarks refers to the rejection of claim 1 as improper; however, the arguments in that section of the Remarks refer to claim 7, not claim 1. For the reasons stated above, the examiner maintains the rejection of claims 7-8 as proper.

C. Applicant also states on page 8 that "[b]y virtue of its dependence, claims 3, 5, and 14 are also believed to be allowable."

However, this argument is confusing because the arguments in that section of the Remarks refer to claim 7-8. Claims 3, 5, and 14 do not depend upon either claim 7 or claim 8; thus, Applicant's logic is unclear.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-5 and 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Branton et al (PCT International Publication Number WO 00/079257 A1, published 28 December 2000) in view of Hoger (J. Polymer Sci. Part A; Poly. Chem., vol. 37, pp.2685-2698 (1999)) as evidenced by Stryer (Biochemistry, 2nd ed., pages 13-15 and 575 (1981)).

It is noted that the prior art of Stryer is relied upon solely for the teaching that proteins comprise functional groups; thus, the claims remain rejected over the prior art of record.

Regarding claims 1, 3 and 12, Branton et al teach an apparatus. In a single exemplary embodiment, Branton et al teach a substrate in the form of a membrane having one or more apertures formed therein (page 4, lines 22-30). Each aperture has a tapered portion with a top diameter greater than a bottom diameter and wherein in each aperture, the tapered portion transitions into a cylindrical portion

having a diameter equal to said bottom diameter of said tapered portion; namely, Figure 3E shows the claimed aperture structure. Branton et al further teach crosslinkers attached to an inner wall of said at least one aperture; namely, chemical crosslinkers are bound to the aperture (page 38, lines 24-30).

Branton et al teach molecules in the form of polymerases attached to the substrate at or near one end of the cylindrical portion of the aperture (page 38, lines 24-30) and apertures having constraining diameters of about 2 nm (page 6, lines 20-30). Polymerases are enzymes that are proteins, which comprise chemical functional groups as evidenced by Stryer. Stryer explicitly states that proteins are built form amino acids that have functional groups occurring as side chains on the residues (pages 13-15) and that DNA polymerases are protein (page 575).

Page 7 of the instant specification also teaches aperture diameters of 2 nm as an embodiment of the instantly claimed diameters. In addition, Figures 8 and 9C of the instant specification show various macro-cycles, which comprise from six phenyl groups connected by six ethynyl groups (i.e., Figure 8) to 18 phenyl groups connected by 18 ethynyl groups (i.e., Figure 9C) as embodiments of the instantly claimed macro-cycle. Thus, a macro-cycle having a range of six phenyl groups connected by six ethynyl groups to 18 phenyl groups connected by 18 ethynyl groups would have a diameter "substantially the same" as an aperture diameter or 2 nm. Thus, the claim has been given the broadest reasonable interpretation consistent with the teachings of the specification regarding substantially the same diameters as the tapered portion (*In re Hyatt*, 211 F.3d1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000) (see MPEP 2111 [R-1]).

Branton et al do not teach an attached macro cyclic ring having a diameter substantially the same as the diameter of the cylindrical portion (i.e., claim 1) and having a rigid phenylethynyl backbone (i.e., claim 3) and functional groups attached thereto (i.e., claim 12). Thus, Branton et al teach a base apparatus that differs from the instantly claimed apparatus because Branton et al do not teach a macro cyclic ring having a rigid phenylethynyl backbone and functional groups attached thereto.

However, Hoger teaches macro-cyclic rings (i.e., claim 1) comprising rigid phenylethynyl backbones (i.e., claim 3; Abstract) attached to solid supports (Scheme 4). Hoger also teaches cyclic compound 11 of Scheme 5, which comprises six phenyl groups connected by 12 ethynyl groups and has functional groups in the form of cyano (i.e., CN) groups attached. Hoger also teaches the macro-cycles have the added benefit that they are host molecules that recognize guest molecules by precise complementarity (page 2687, column 2, lines 19-25) and can act as artificial enzymes (page 2687, last two lines-page 2688, first two lines). Thus, Hoger teaches the known technique of using macro-cyclic rings (i.e., claim 1) comprising rigid phenylethynyl backbones (i.e., claim 3) having functional groups attached (i.e., claim 12) immobilized on solid surfaces.

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was claimed to have modified the apparatus as taught by Branton et al with the macro-cyclic ring as taught by Hoger et al with a reasonable expectation of success. The modification would result in the immobilization of a macro-cyclic ring (i.e., claim 1) comprising a rigid phenylethynyl backbone (i.e., claim 3) having functional groups attached (i.e., claim 12at the aperture. The diameter of the macro-cycle would be substantially the same as the diameter of the cylindrical portion of the aperture because the diameter of the ring of Hoger is substantially the same as the diameter of the ring exemplified by the molecules of Figure 8 and 9C of the instant specification, as well as substantially the same as the diameter of the cylindrical portion of the aperture because the apertures of Branton et al are the same (i.e., about 2 nm) as the aperture diameters on page 7 of the instant specification. The ordinary artisan would have been motivated to make such a modification because said modification would have resulted in an apparatus having host molecules therein that recognize guest molecules by precise complementarity as explicitly taught by Hoger et al (page 2687, column 2, lines 19-25). In addition, it would have been obvious to the ordinary artisan that the known technique of using the macro-cycles of Hoger could have been applied to the apparatus of Branton et al with predictable results because the macro-cycles of Hoger are predictably attached to and used on solid surfaces. Furthermore, the teachings of Hoger that the

macro-cycles are host molecules that recognize guest molecules by precise complementarity (page 2687, column 2, lines 19-25) and can act as artificial enzymes (page 2687, last two lines-page 2688, first two lines) clearly suggests to the ordinary artisan that the macro-cycles of Hoger could be used to detect binding of other molecules in place of the molecules (i.e., polymerases) in the apertures of Branton et al.

Regarding claim 2, the apparatus of claim 1 is discussed above. Branton et al teach the substrate is glass (page 4, lines 19-25).

Regarding claim 4, the apparatus of claim 1 is discussed above. Hoger et al also teach the attachment of biological or chemical probes to the macro-cyclic ring; namely, guest molecules are bound to said macro-cyclic rings, which as the added advantage of allowing binding of additional guest members so that chemical reactions can be induced between the guests (page 2687, last 10 lines) and that the macro-cycles can act as artificial enzymes (page 2687, last two lines-page 2688, first two lines). .

Thus, Hoger teaches the known technique of using the attachment (i.e., binding) of biological or chemical probes to the macro-cyclic ring.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the apparatus as taught by Branton et al in view of Hoger with the attachment of biological or chemical probes to the macro-cyclic ring of Hoger with a reasonable expectation of success. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in as apparatus having the added advantage of binding of additional guest members so that chemical reactions can be induced between the guests as explicitly taught by Hoger (page 2687, last 10 lines). In addition, it would have been obvious to the ordinary artisan that the known technique of using the attachment of biological or chemical probes to the macro-cyclic ring as taught by Hoger could have been applied to the apparatus of Branton et al in view of Hoger with predictable results because the technique predictably result in macro-cycles attached to probe molecules. Furthermore, the teachings of Hoger that the macro-cycles are host molecules that recognize guest molecules by precise complementarity (page 2687, column 2, lines 19-25) and can act as artificial

enzymes (page 2687, last two lines-page 2688, first two lines) clearly suggests to the ordinary artisan that the macro-cycles of Hoger could be used to detect binding of other molecules in place of the molecules (i.e., polymerases) in the apertures of Branton et al.

Regarding claim 5, the apparatus of claim 4 is discussed above. Branton et al further teach the biological probe comprises a single strand sequence of DNA; namely, nucleic acids are bound to the molecules (i.e., polymerase catalysts) attached to the aperture (page 30, lines 5-15). Therefore, the modification of the apparatus of Branton et al with the teachings of

Regarding claim 13, the apparatus of claim 1 is discussed above. Branton et al teach electrodes positioned to allow measurement of a current across the aperture; namely, conducting electrodes are provided on both sides of the membrane to enable electronic sensing (page 5, lines 20-26), and current is detected (page 8, line 30-page 9, line 5).

Regarding claim 14, the apparatus of claim 13 is discussed above. Branton et al also teach a device coupled to the electrodes for measuring the current across the aperture; namely, an ammeter or electrometer (page 7, lines 10-11).

Regarding claim 15, the apparatus of claim 14 is discussed above. Branton et al further teach coupling of a chemical or biological material to the antibodies of chemical functional groups causes a change in current across the aperture, the change being detectable by the device; namely, current is detected as a result of polymer interactions with the aperture (page 8, line 30-page 9, line 5).

In addition, as noted above, apparatus claims cover what a device *is*, not what a device *does*. Therefore, the various uses recited in claim 15 (e.g., coupling a material [which is an **active step**], or causing a change in current) fail to define additional structural elements to the device of 15. Because the prior art teaches the structural elements of claim 15, the claim is obvious over the prior art.

Response to Arguments

Applicant's arguments regarding the rejections of the claims as obvious over Branton et al in view of Hoger have been fully considered but they are not persuasive for the reason(s) listed below.

A. In response to applicant's argument on page 8 of the Remarks that Hoger is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Hoger teaches the macro-cycles are host molecules that recognize guest molecules by precise complementarity (page 2687, column 2, lines 19-25) and can act as artificial enzymes (page 2687, last two lines-page 2688, first two lines). Thus, the teachings of Hoger that the macro-cycles are host molecules that recognize guest molecules by precise complementarity (page 2687, column 2, lines 19-25) and can act as artificial enzymes (page 2687, last two lines-page 2688, first two lines) are clearly suggests that the macro-cycles are analogous to the aperture molecules of Branton et al because both the molecules of Branton (i.e., the polymerases) and the macro-cycles of Hoger are used to bind to other molecules.

B. Applicant also argues on page 9 of the Remarks that "Day" does not disclosed detection of chemical or biological materials.

However, no prior art of "Day" is cited; thus, the examiner assumes the argument refers to Hoger. As detailed above, Hoger explicitly teaches the macro-cycles are host **molecules** that recognize guest **molecules** by precise complementarity (page 2687, column 2, lines 19-25) and can act as artificial enzymes (page 2687, last two lines-page 2688, first two lines). Molecules are chemical materials, and the art of Hoger is analogous to that of Branton et al.

C. Applicant further argues on page 9 of the Remarks that the rejections fail the Graham test because there is not suggestion or motivation to modify the references.

However, as noted in the rejections above, the ordinary artisan would have been motivated to make such a modification because said modification would have resulted in an apparatus having host

molecules therein that recognize guest molecules by precise complementarity as explicitly taught by Hoger et al (page 2687, column 2, lines 19-25). In addition, it would have been obvious to the ordinary artisan that the known technique of using the macro-cycles of Hoger could have been applied to the apparatus of Branton et al with predictable results because the macro-cycles of Hoger are predictably attached to and used on solid surfaces. Furthermore, the teachings of Hoger that the macro-cycles are host molecules that recognize guest molecules by precise complementarity (page 2687, column 2, lines 19-25) and can act as artificial enzymes (page 2687, last two lines-page 2688, first two lines) clearly suggests to the ordinary artisan that the macro-cycles of Hoger could be used to detect binding of other molecules in place of the molecules (i.e., polymerases) in the apertures of Branton et al.

In addition , it is also noted that under the Supreme Court ruling for *KSR Int'l Co. v. Teleflex, Inc* (No 04-1350 (US 30 April 2007) forecloses the argument that a **specific** teaching, suggestion, or motivation is required to support a finding of obviousness. See *Ex parte Smith* (USPQ2d, slip op. at 20 (Bd. Pat. App. & Interf. June 25, 2007).

D. Applicant asserts on pages 9-10 of the Remarks that no showing has been made that the substitution would work because the chemical arts are unpredictable.

However, as noted above, Hoger explicitly teaches the macro-cycles are host **molecules** that recognize guest **molecules** by precise complementarity (page 2687, column 2, lines 19-25) and can act as artificial enzymes (page 2687, last two lines-page 2688, first two lines). Molecules are chemical materials; thus, Hoger clearly teaches that the macro-cycles are used to trap other chemical materials via host-guest interactions, which provides a reasonable expectation of success.

E. Applicant also asserts on page 10 of the Remarks that the lack of using cyclicals in Branton et al is evidence that such a substitution was not predictable.

However, as Branton et al is not relied upon for the teaching of the use of cyclicals. As noted above, Hoger explicitly teaches the macro-cycles are host molecules that recognize guest molecules by precise complementarity (page 2687, column 2, lines 19-25) and can act as artificial enzymes (page 2687,

last two lines-page 2688, first two lines). Molecules are chemical materials; thus, Hoger clearly teaches that the macro-cycles are used to trap other chemical materials via host-guest interactions, which provides a reasonable expectation of success.

In addition, Applicant's arguments ignore the teachings of Hoger as detailed above. Thus, Applicant is arguing against Branton et al individually. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

F. Applicant further asserts on page 10 of the Remarks that Hoger renders the invention of Branton et al unsatisfactory for its intended purpose.

However, Branton et al specifically teach the apparatus is for evaluation of a polymer molecule by causing the polymer molecule to move through an aperture in sequential order (Abstract), and that a voltage gradient is used to pull the molecule (i.e., a DNA molecule) thorough the aperture (page 37, lines 7-30 and page 7, lines 10-15). Thus, the electric field of Branton et al would still pull the molecule through the aperture even after modification with the teachings of Hoger.

In addition, MPEP 716.01(c) makes clear that "[t]he arguments of counsel cannot take the place of evidence in the record" (*In re Schulze*, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965)).

Further, Applicant's arguments appear to undermine the intended use of the apparatus, which, according to withdrawn claim 11, requires passage of a sample through a functionalized aperture. Thus, if Applicant's own arguments were true, the best mode of the invention would itself be inoperable.

G. Applicant argues on page 11 of the Remarks that the biological motor created by the polymerase would no longer function if the molecules of Hoger replace the polymerase.

However, as noted above, Branton et al specifically teach the apparatus is for evaluation a polymer molecule by causing the polymer molecule to move through an aperture in sequential order (Abstract), and that a voltage gradient is used to pull the molecule (i.e., a DNA molecule) thorough the

aperture (page 37, lines 7-30 and page 7, lines 10-15). Thus, the electric field of Branton et al would still pull the molecule through the aperture even after modification with the teachings of Hoger.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Branton et al (PCT International Publication Number WO 00/079257 A1, published 28 December 2000) in view of Hoger (J. Polymer Sci. Part A; Poly. Chem., vol. 37, pp.2685-2698 (1999)) as evidenced by Stryer (Biochemistry, 2nd ed., pages 13-15 and 575 (1981)) as applied to claim 1 above, and further in view of Go et al (U.S. Patent No 5,04,820, issued 14 April 1992).

Regarding claim 6, the apparatus of claim 1 is discussed above in Section 6.

Branton et al also teach Figure 5A, which shows a substrate comprising dielectric layer 50, silicon wafer 130, a layer of silicon nitride 134, conductive layer 46 (pages 19 and 24), and an additional layer of silicon oxide (i.e., silicon dioxide; page 19, lines 19-25). The dielectric layer is also silicon nitride (page 25). Thus, Branton et al in view of Hoger teach an apparatus that differs from the instantly claimed apparatus in that Branton et al and Hoger do not teach the conductive layer is silicon.

However, Go et al teach silicon has the added advantage of having a relatively high electrical conductivity and heat dissipation (column 3, lines 40-60). Thus, Go et al teach the known technique of using silicon as a conductor.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the apparatus comprising a multilayered substrate as taught by Branton et al in view of Hoger with the silicon conductor of Go et al with a reasonable expectation of success. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in an apparatus having the added advantage of having a conductor layer having relatively high electrical conductivity and heat dissipation as explicitly taught by Go et al (column 3,lines 40-60). In addition, it would have been obvious to the ordinary artisan that the known technique of using the silicon conductor of Go et al could have been applied to the apparatus of

Branton et al in view of Hoger with predictable results because the silicon predictably results in a conductive element.

Response to Arguments

Applicant's arguments regarding the rejection of claim 6 rely on the alleged deficiencies of Branton et al in view of Hoger. These alleged deficiencies are addressed above. Because the arguments regarding Branton et al in view of Hoger were not persuasive, the rejection of claim 6 is maintained.

8. Claims 7 and 9 rejected under 35 U.S.C. 103(a) as being unpatentable over Branton et al (PCT International Publication Number WO 00/079257 A1, published 28 December 2000) in view of Go et al (U.S. Patent No 5,04,820, issued 14 April 1992) as evidenced by Stryer (Biochemistry, 2nd ed., pages 13-15 and 575 (1981)).

It is noted that this rejection applies to claim 7 to the extent that it is drawn to the embodiment of dependent claim 7.

Regarding claim 9, Branton et al teach the apparatus of claim 7. In a single exemplary embodiment, Branton et al teach a substrate in the form of a membrane having one or more apertures formed therein (page 4, lines 22-30). Each aperture has a tapered portion with a top diameter greater than a bottom diameter and wherein in each aperture, the tapered portion transitions into a cylindrical portion having a diameter equal to said bottom diameter of said tapered portion; namely, Figure 3E shows the claimed aperture structure. Branton et al further teach crosslinkers attached to an inner wall of said at least one aperture; namely, chemical crosslinkers are bound to the aperture (page 38, lines 24-30). Branton et al also teach chemical functional groups in the form of polymerases attached to the substrate at or near one end of the cylindrical portion of the aperture (page 38, lines 24-30). Polymerases are proteins, which comprise chemical functional groups as evidenced by Stryer. Stryer explicitly states that proteins are

built form amino acids that have functional groups occurring as side chains on the residues (pages 13-15) and that DNA polymerases are protein (page 575).

Branton et al also teach Figure 5A, which shows a substrate comprising dielectric layer 50, silicon wafer 130, a layer of silicon nitride 134, conductive layer 46 (pages 19 and 24), and an additional layer of silicon oxide (i.e., silicon dioxide; page 19, lines 19-25). The dielectric layer is also silicon nitride (page 25). Thus, Branton et al teach an apparatus that differs from the instantly claimed apparatus in that Branton et al do not teach the conductive layer is silicon.

However, Go et al teach silicon has the added advantage of having a relatively high electrical conductivity and heat dissipation (column 3, lines 40-60). Thus, Go et al teach the known technique of using silicon as a conductor.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the apparatus comprising a multilayered substrate as taught by Branton et al with the silicon conductor of Go et al with a reasonable expectation of success. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in an apparatus having the added advantage of having a conductor layer having relatively high electrical conductivity and heat dissipation as explicitly taught by Go et al (column 3,lines 40-60). In addition, it would have been obvious to the ordinary artisan that the known technique of using the silicon conductor of Go et al could have been applied to the apparatus of Branton et al with predictable results because the silicon predictably results in a conductive element.

Response to Arguments

Applicant's arguments regarding the rejection of claim 9 rely on the alleged deficiencies of Branton et al. These alleged deficiencies are addressed above. Because the arguments regarding Branton et al were not persuasive, the rejection of claim 9 is maintained.

Conclusion

9. No claim is allowed.

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

11. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert T. Crow whose telephone number is (571)272-1113. The examiner can normally be reached on Monday through Friday from 8:00 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ram Shukla can be reached on (571) 272-0735. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Robert T. Crow/
Examiner, Art Unit 1634

/Diana B. Johannsen/
Primary Examiner, Art Unit 1634

Robert T. Crow
Examiner
Art Unit 1634